Algorithms for the prevention and treatment of friction injury

Algoritmos para prevenção e tratamento de lesão por fricção

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Abstract

Objective: Develop and validate the content of algorithms for the prevention and treatment of friction injury.

Methods: For the construction of algorithms, an integrative literature review was conducted after searching SciELO, LILACS and MEDLINE databases. The algorithms were evaluated by 26 raters – 10 physicians and 16 nurses – using the Delphi technique. The results were analyzed by the Content Validity Index (CVI).

Results: In the first evaluation cycle, the items of the algorithms were considered "inadequate" to "totally adequate" by the raters. After adjustments suggested by the raters, the algorithms were submitted to a second evaluation cycle, when all items were considered "adequate" or "totally adequate," resulting in a content validity index of 1.0.

Conclusion: The algorithms have valid content and can help health professionals in the evaluation, prevention and treatment of friction injuries.

Resumo

Objetivo: Elaborar e validar o conteúdo de algoritmos para prevenção e tratamento de lesão por fricção.

Métodos: Para a construção dos algoritmos, foi realizada uma revisão integrativa da literatura após busca nas bases de dados: SciELO, LILACS e MEDLINE. A avaliação dos algoritmos foi realizada por 26 juízes, sendo 10 médicos e 16 enfermeiros, utilizando-se a técnica Delphi. Os resultados foram analisados por meio do Índice de Validade de Conteúdo.

Resultados: No primeiro ciclo de avaliação, os itens dos algoritmos foram considerados pelos juízes de "inadequados" a "totalmente adequados". Após as correções sugeridas pelos juízes, os algoritmos foram reenviados para o segundo ciclo de avaliação, no qual todos os itens foram julgados "adequados" ou "totalmente adequados", resultando em um Índice de Validade do Conteúdo de 1,0.

Conclusão: Os algoritmos desenvolvidos possuem validade de conteúdo e podem auxiliar profissionais de saúde na avaliação, prevenção e tratamento da lesão por fricção.

Resumen

Objetivo: Elaborar y validar el contenido de algoritmos para prevención y tratamiento de lesión por fricción.

Métodos: Para la construcción de los algoritmos, se realizó una revisión integradora de la literatura luego de una búsqueda en las bases de datos: SciELO, LILACS y MEDLINE. La evaluación de los algoritmos fue realizada por 26 jueces, de los cuales 10 eran médicos y 16 enfermeros, con la utilización del método Delphi. Los resultados fueron analizados mediante el Índice de Validez de Contenido.

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Resultados: En el primer ciclo de evaluación, los ítems de los algoritmos fueron considerados desde "inadecuados" a "totalmente adecuados" por los jueces. Luego de las correcciones sugeridas por los jueces, se enviaron los algoritmos para el segundo ciclo de evaluación, en el que todos los ítems fueron considerados "adecuados" o "totalmente adecuados", lo que tuvo como resultado un Índice de Validez de Contenido de 1,0.

Conclusión: Los algoritmos elaborados tienen validez de contenido y pueden ayudar a profesionales de la salud en la evaluación, prevención y tratamiento de la lesión por fricción.

Introduction

Skin is the largest organ of the human body and is subject to aggressions of intrinsic and extrinsic pathological factors that can cause changes in skin constitution, such as pressure injury, burn, traumatic ulcer, dermatitis and friction injury, among others, and lead to functional disability and changes in the quality of life of individuals.[1-3] Wounds often occur in the daily routine of health care services; the most frequent wounds are pressure injuries, diabetic ulcers, venous ulcers, and friction injuries, and have become a public health problem. The presence of these injuries negatively affects the quality of life of individuals and their families, and their high incidence rates, especially among the elderly population, have an economic impact on the health area.[4,5]

This study considered the term 'friction injuries' which include wounds caused by skin tear, shear and blunt force.[6]

Friction injury is the result of trauma caused by skin friction, shear and blunt force. Tension in retraction, friction or shock between an individual's skin and the bed surface or objects nearby can cause wounds of partial or full thickness. The production of serous fluid, especially in the first 24 hours, makes the friction injury very wet.[7,8] Several studies report 42% of these injuries are on the elbows, 22% on the legs and 13% on the hands.[9-11]

Friction injuries occur predominantly among elderly or very young people, such as neonates. Aging causes reduced skin functions and internal structures. Skin becomes pale and saggy, with less turgor due a lower rate of cell renewal and low immune tolerance, among other factors.[12] These alterations favor the occurrence of friction injuries among elderly people.

Health professionals in direct contact with the elderly play an important role in holistic care, which considers physical, social, emotional and spiritual needs of the individual,[13] and are extremely important for the prevention and treatment of friction injuries.[14] Multidisciplinary health teams should provide humanized, systematized and personalized care to elderly people with friction injuries, or patients with risk factors, by adopting preventive measures or prescribing more appropriate coverage, according to the category of friction injury identified in clinical examination.[14]

Nurses are often in contact with the patient, as they monitor injury progress, guide and perform prevention and treatment care, and have skills to perform injury care techniques considering their academic training addresses components focused on this practice and the fact that such techniques are part of the nursing team's assignments.[14]

Patient care procedures may involve the development of protocols in the form of algorithms, whose construction must be based on scientific knowledge from literature reviews of meta-analysis from indexed journals. Algorithms consist of a finite sequence of well-defined instructions that are systematically performed. They are essential tools for quality management and process organization. In health, these instruments are simple, direct and easily accessible. They provide a complete view of the care process, presented as maps and guiding decision-making processes.[15-18]

This study aimed to develop and validate the content of algorithms for the prevention and treatment of friction injuries. The purpose of these algorithms is to support health professionals who provide care to patients with or at risk for friction injury with a view to developing injury care plans that offer appropriate prevention and treatment strategies, leading to a broad therapeutic approach with a variety of appopriate methods to implement it.

Methods

This applied study of method development was conducted for technology production. It was approved by the institutional research ethics committee, process nº 1.239.421. The study was conducted between July 2016 and August 2017. All health professionals who agreed to participate in the study signed an informed consent form (ICF) when they were included in the panel of raters. The ICF clearly explained to participants the study content, ensuring non-disclosure of personal information and free decision to withdraw, at any time, their consent to participate in the study.

For the construction of algorithms, an integrative literature review was conducted with the databases of health sciences, including MEDLINE (Medical Literature Analysis and Retrieval System Online), SciELO (Scientific Electronic Library Online) and LILACS (Latin American and Caribbean Health Science Literature Database). The following health sciences descriptors (DeCS) were used: 'friction,' 'wound and injury,' and 'skin' in Portuguese, English and Spanish. The search strategy for each language was determined by combining the selected descriptors and Boolean operator *AND*, for example: (1) friction *AND* wound and injury; (2) friction *AND* wound *AND* skin.

The inclusion criteria for the selection of publications were: only primary studies, published in Portuguese, English and Spanish, available in full and without a proposed time period as the intention was to compile all studies that met the established criteria. The following were excluded: theses, dissertations, monographs, technical reports, case reports, reference works and articles that, after reading the abstract, were not aligned with the proposed study theme, in addition to repeated publications in databases and virtual libraries.

After selecting the studies, the algorithms were developed, comprising a sequence of procedures described in four stages: clinical evaluation, injury classification, therapeutic procedures, and preventive measures.

Stage 1 involves a clinical evaluation, which must include a detailed examination of the patient's skin conditions, associated risk factors for friction injury, adjacent skin conditions, edema, color and ecchymosis aspect, presence of flap skin, flap characteristics (pale, dusky or darkened), presence of bleeding, measurement, type of tissue, and presence of exudate.

Stage 2 classifies the friction injury. The Portuguese version of the STAR Skin Tear Classification System was used.[19] This instrument shows five categories of friction injuries, namely:

- Category 1a: a skin tear where the edges can be realigned to the normal anatomical position (without undue stretching) and the skin or flap color is not pale, dusky or darkened.
- Category 1b: a skin tear where the edges can be realigned to the normal anatomical position (without undue stretching) and the skin or flap color is pale, dusky or darkened.
- Category 2a: a skin tear where the edges cannot be realigned to the normal anatomical position and the skin or flap color is not pale, dusky or darkened.
- Category 2b: a skin tear where the edges cannot be realigned to the normal anatomical position and the skin or flap color is pale, dusky or darkened.
- Category 3: a skin tear where the skin flap is completely absent.[19]

Stage 3 refers to therapeutic approaches to treat the friction injury. Local skin and injury care was presented, as well as the ideal dressing, aiming to promote wound healing and reduce pain. The dressing must be easily removed and act as a protective barrier to prevent bacteria penetration. Coverage of friction injury dressing is selected according to the result of injury evaluation and classification.

Stage 4 shows preventive measures for friction injuries. After the health professional performs a clinical evaluation and identifies all intrinsic and extrinsic risk factors for the development of friction injury, the algorithm suggests a plan with friction injury preventive measures.

Algorithm content was validated by physicians and nurses who provide wound treatment, graduate nurses in stoma therapy registered with the Brazilian Association of Stomal Therapy, and graduate nurses in dermatology registered with the Brazilian Association of Dermatology Nursing.

To participate in content validation, the raters needed to have a nursing or medical degree, at least one year of experience in treating patients with skin injury. An invitation letter was sent to 35 health professionals presenting the approval of the Institutional Research Ethics Committee and explaining the study topic, the importance of a professional evaluation for the study, the steps of effective participation of raters, and the 15-day deadline to return the completed questionnaire in each round of the evaluation. A total of 26 health professionals agreed to participate in the study and returned the questionnaire within the requested deadline. Professionals who agreed to participate in the study, but who did not answer or return the questionnaire for algorithm evaluation within 15 days were excluded from the study.

For the validation of the algorithms, a specific questionnaire was sent to the raters, which had two sections: one with four questions for rater identification, and the other with 15 questions for algorithm evaluation. The raters evaluated the following main themes of the algorithms: thematic content, graphic presentation, sequence of algorithms, clarity and understanding of the information, definition of friction injury and categories, coverage used in different categories, risk factors, and preventive measures. A Likert scale was used in algorithm evaluation questions with the following answers: fully adequate, adequate, partially adequate, inadequate, and not applicable. Optional questions were measured with a dichotomous scale of yes/no answers, with instructions for descriptive answers.

The Delphi technique was used for algorithm validation. This method uses questionnaires to obtain the opinion of raters with specific knowledge in a certain area. The questionnaire content is analyzed by raters seeking to reach a consensus among them. Two or three evaluation cycles are usually required, but some processes may require more.[20]

The content validity index was used to measure the degree of agreement among raters in specific aspects of the algorithms developed in this study, which were examined using the evaluation questionnaire. The content validity index for questionnaire validation was calculated as the sum of 'adequate' and 'fully adequate' answers divided by the total number of answers. The content validity index must be 0.80 or greater (i.e., 80% of agreement among raters), when six or more raters participate in the instrument validation.[21]

Results

Among the 35 health professionals invited to participate in the study, 26 accepted the invitation (raters) – 10 physicians and 16 nurses – who answered the questionnaire within the requested period of 15 days.

The items of the algorithms were evaluated in the first evaluation cycle as 'fully adequate' to 'inadequate.' Although all items reached a content validation index above the minimum value of 0.80 in the first evaluation cycle, the algorithms were adjusted according to the raters' suggestions and submitted to a second evaluation cycle. All items of the algorithms were evaluated as 'fully adequate' or 'adequate' in the second cycle and, therefore, validated with a content validation index of 1.0 (Table 1).

After content validation by the raters, the final versions were developed for the two algorithms. Figures 1 and 2 show the general schemes of friction injury prevention and treatment algorithms, respectively.

Discussion

The number of friction injury cases associated with several risk factors that are present in the daily routine of debilitated patients has increased. Aging is one of the factors that influence such increase in

Table 1. Content evaluation of algorithm items for the prevention and treatment of friction injury in the first and second cycles using the Delphi technique

#	Items evaluated	Inadequate		Partially adequate		Adequate		Fully adequate		CVI	
		1st C	2nd C	1st C	2nd C	1st C	2nd C	1st C	2nd C	1st C	2nd C
		N	N	N	N	N	N	N	N		
1	Thematic content	0	0	0	0	10	10	16	16	0.932	1.00
2	Graphic presentation	0	0	1	0	6	6	19	20	0.962	1.00
3	Sequence of algorithms	0	0	3	0	6	6	17	20	0.885	1.00
4	Clarity and understanding	0	0	3	0	10	11	13	15	0.885	1.00
5	Definition of friction injury	0	0	1	0	5	5	20	21	0.962	1.00
6	Pre-dressing care	0	0	1	0	5	6	20	20	0.962	1.00
7	Definition of categories 1a and 1b	0	0	1	0	5	6	20	20	0.962	1.00
8	Types of coverage for injury 1a and 1b	0	0	1	0	6	6	19	20	0.962	1.00
9	Definition of categories 2a and 2b	0	0	0	0	4	4	22	22	0.944	1.00
10	Types of coverage for injury 2a and 2b	0	0	0	0	9	09	17	17	0.934	1.00
11	Definition of category 3	0	0	0	0	5	4	21	22	0.937	1.00
12	Types of coverage for injury 3	0	0	1	0	9	10	16	16	0.962	1.00
13	Risk factors	0	0	2	0	3	4	21	22	0.923	1.00
14	Preventive measure with the presence of risk factors	0	0	2	0	8	10	16	16	0.923	1.00
15	Preventive measure without risk factors	1	0	3	0	7	8	15	18	0.846	1.00

CVI: content validation index; 1st C – first evaluation cycle; 2nd C – second evaluation cycle; # - question number in the evaluation questionnaire.

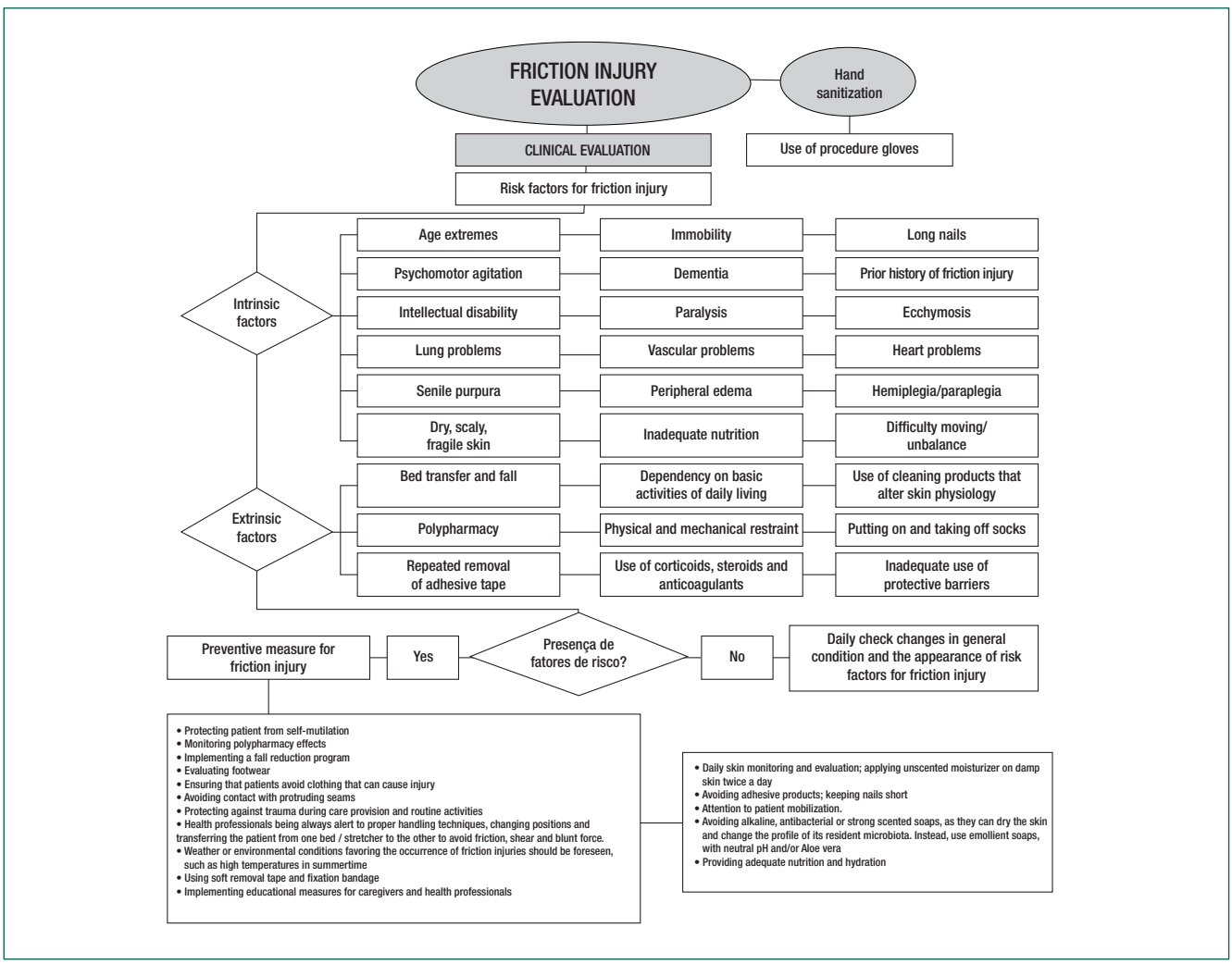

Figure 1. Algorithm for the assessment of friction injury risk factors and prevention

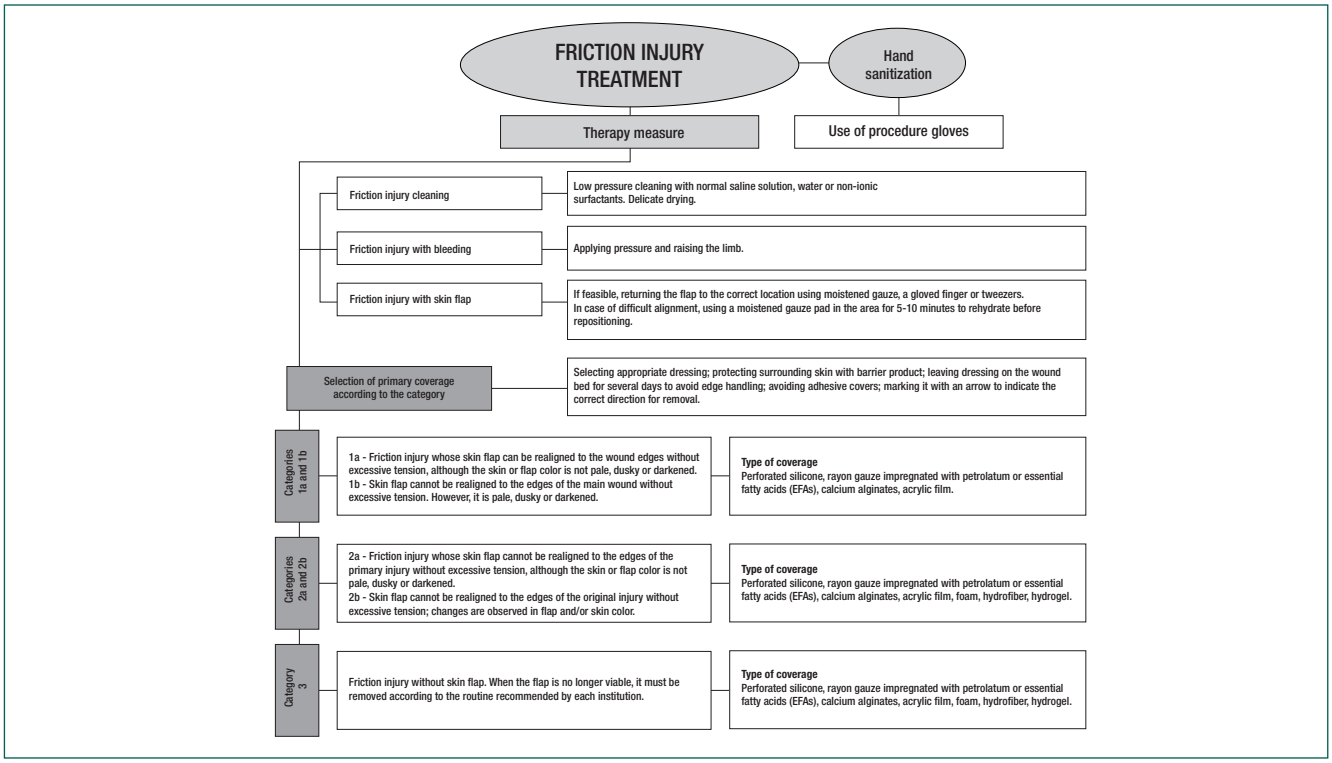

Figure 2. Algorithm for friction injury treatment

friction injury. Estimates suggest that about 1.5 million friction injuries occur every year in hospitalized elderly people.[22-25] The prevalence of friction injuries is three times greater than the prevalence of pressure injuries, with average prevalence of 10.7%.[7-23,26]

Friction injuries have a direct impact on quality of life due to a possibility of associated infections, which increases health care costs to this population. A proper treatment of friction injury is very important and dressing materials must provide safe healing, preventing further damage during handling due to high sensitivity of the affected skin.[25,26]

Knowledge about the topic of professionals involved in this type of care is important for successful therapy. Thus, to promote access to such information, this study analyzed the development of algorithms for the prevention and treatment of friction injuries. The algorithms were built after a literature review using the main health sciences databases. The selection of different covers for the prevention and treatment of skin injuries requires health professionals to have technical and scientific knowledge about the physiology, anatomy, efficacy/effectiveness and cost-effectiveness of innovative coverings available in the market.[3,27]

Two algorithms were built and validated for their content aiming to contribute to the management and standardization of nursing care for patients with friction injuries, guide nurse conduct, and support decisions of health professionals involved in prevention and treatment of this population.

After the first evaluation cycle of the initial version of the developed algorithms, the answers and suggestions of raters for each question marked as 'partially adequate' or 'inadequate' were analyzed. These suggestions referred to different aspects, from small details like changing some words for a better understanding of the text to important considerations about risk factors and changes in the sequence of presentation of items. Relevant suggestions were accepted, so there were no negative responses in the second evaluation cycle, increasing the reliability of the final instrument, as observed in other studies.[7-22,26]

Algorithms built for the prevention and treatment of friction injuries must provide health professionals with a description of techniques, steps to

perform certain tasks, information for care management with quality and safety for the patient, allowing health professionals to have a better visualization and understanding of the procedure to be performed.

The content validity index was close to 1.0 in all questions in the first evaluation cycle and 1.0 in the second cycle, confirming that all aspects addressed in the algorithms are presented in an understandable way and that an agreement was observed among the raters regarding the relevance of all items. Recent articles in the health field also used the content validity index in instrument validation.[27,28,29] In health, the algorithms present a complete view of the care process and support health professionals in providing care with quality and in decision-making process, especially when decisions are complex, providing patient safety. An instrument must be validated by professionals operating in corresponding field.[15,30]

Protocols, algorithms, booklets, manuals, flowcharts and guidelines are important tools to help address several issues in care and management of health services. Studies based on scientific evidence use technical, organizational and political guidelines and are focused on standardization of clinical, surgical and preventive measures.[31-33] The development of new tools requires the incorporation of new technologies that fulfill the needs of treatments and health care organizations.[15,18,31]

Healing is a complex systemic process that requires the body to promote, produce and inhibit different molecular and cellular components. The algorithm determines, in an orderly and continuous sequence, the tissue repair process and the risk factors for the patient to have an injury. In order to optimize healing, wound moisture must be maintained. Based on this idea, many types of covering that favor healing, such as those proposed in these algorithms, are available in the market for the prevention and treatment of friction injuries in a moist environment.

The algorithms developed in this study are intended to guide health professionals in providing patient care in a timely and effective manner, with quality and free of risk and damage to the patient.

Conclusion

In this study, two algorithms were built and had their content validated; these algorithms can assist health professionals in the assessment, prevention and treatment of friction injuries.

Collaborations

Pinheiro RV, Salomé GM, Miranda FD, Alves JR, Reis FA and Mendonça ARA contributed to the study design, data analysis and interpretation, writing of the article, relevant critical review of the intellectual content, and approval of the final version to be published.

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